

Our Reference: YAZ-176-A

PATENT

## **TERMINAL WITH CARD EDGE LOCKING PROVISIONS**

### FIELD OF THE INVENTION

**[0001]** This invention relates to electrical terminals and more particularly to a self-stabilizing terminal designed to receive a circuitboard having a conductive trace on at least one of two opposite surfaces thereof.

### BACKGROUND OF THE INVENTION

**[0002]** A co-pending application for U.S. patent, Serial No. 10/624,073, filed July 21, 2003, discloses an electrical terminal in which spring contacts held in a carrier body are brought into engagement with conductive pads on one or more surfaces of a circuitboard proximate an edge thereof. The terminals disclosed in the above-identified application are box-like metal bodies formed by strategically bending a stamping so as to exhibit a spring contact which is extended axially outward and is curved or folded back to provide a resilient member which slidably engages an edge trace on the circuitboard. The carrier body positions the contact member so that it is brought into resilient engagement with the trace on the circuitboard as the board is inserted into the body.

**[0003]** Another co-pending application, Serial No. 10/639,307, filed August 12, 2003, discloses a conductive spring-type terminal for connecting a wire or cable to an edge trace on a circuitboard by gripping or trapping the circuitboard between opposing contact elements. The terminal body exhibits a main spring contact on one side of the body and, in opposing relationship to the main contact, a pair of stabilizing contacts which are spread apart so as to effectively straddle the projected area of the main contact thereby to improve the stability of the electrical contact and help to prevent intermittent contact which sometimes occurs with prior art devices.

**[0004]** The terminals described above are preferably made from conductive metal stampings which, after the stamping operation, are bent and mechanically locked into the desired box-like shape.

### SUMMARY OF THE INVENTION

**[0005]** The present invention provides an improved card edge terminal for making electrical contact with a circuitboard having an edge trace on at least one side and which provides an essentially consistent contact force even though the terminal may be exposed to harsh environmental conditions such as thermal shock, vibration, and other such conditions which tend to cause a variation in contact force and/or destabilize the terminal from the circuitboard to which it is mechanically and electrically connected.

**[0006]** In general, the objectives of the present invention are achieved by providing an integral box-like body of conductive material having a first pair of laterally spaced arms for engaging a trace surface of a circuitboard, a second pair of laterally spaced arms to engage a second circuitboard surface opposite said trace surface, the first and second pairs of arms being spaced apart to define a circuitboard receiving volume therebetween, and a spring contact extending from at least one of the arms of the first pair toward the second pair of arms and into said receiving volume to engage a trace on said trace surface when the circuitboard is inserted into the volume.

**[0007]** In the preferred form, the first pair of arms are substantially shorter than the second pair of arms, extend parallel thereto in overlying relationship and are provided with detent portions on the distal or free ends thereof to flex and drop into a slot near the edge of the circuitboard and in the non-trace surface thereof to mechanically snap lock the terminal to a circuitboard and provide mechanical stability in the mechanical/electrical engagement therebetween.

**[0008]** Other applications of the present invention will become apparent to those skilled in the art when the following description of the best mode contemplated for practicing the invention is read in conjunction with the accompanying drawing.

### BRIEF DESCRIPTION OF THE DRAWING

**[0009]** The description herein makes reference to the accompanying drawing wherein like reference numerals refer to like parts throughout the several views, and wherein:

**[0010]** FIG. 1 is a perspective view of a terminal constructed in accordance with the present invention prior to engagement with a circuitboard designed to mate with such terminal;

**[0011]** FIG. 2 is a perspective view of the combination of FIG. 1 with the circuitboard partially inserted into the box-like terminal;

**[0012]** FIG. 3 is a perspective view of the combination of FIGS. 1 and 2 with the circuitboard fully inserted into engagement with the terminal;

**[0013]** FIG. 4 is a side view in section of the combination of FIG. 3; and

**[0014]** FIG. 5 is a plan view of a metal stamping from which the box-like terminal of FIGS. 1-3 may be formed.

#### DETAILED DESCRIPTION OF THE ILLUSTRATIVE EMBODIMENT

**[0015]** Referring to FIGS. 1-4, there is shown a box-like metal terminal 10 in combination with a circuitboard 12 of the type having opposed parallel flat surfaces 14 and 18. A slot 16 is formed near the edge of the surface 14 and an edge trace 20 is deposited on the opposite surface 18 near the edge of the circuitboard 12.

**[0016]** The box-like terminal 10 comprises a stamped and folded box-like body 22 defining a first pair of laterally spaced apart arms 24 and 26 and a second upper pair of spaced apart arms 28 and 30. The lower arms 24 and 26 are laterally spaced apart by approximately the same lateral spacing as the distance between the upper arms 28 and 30 such that the upper arms essentially overlies the lower arms but are spaced therefrom a sufficient distance to define a volume which is adapted to receive the circuitboard 12 as shown in FIGS. 3 and 4. The lower arms 24 and 26 are longer than the upper arms 28 and 30. Between the arms 24 and 26 and integral therewith over the bottom extension thereof is a spring contact 40 which is folded back on itself to extend upwardly toward and to a position between the upper arms 28 and 30 so as to substantially span the entire circuitboard receiving volume between the upper and lower pairs of arms when undeflected.

**[0017]** In addition to the details described above, the upper arms 28 and 30 are provided at the distal or free ends thereof with lobe-like detents 32 and 34 which extend or depend downwardly toward the lower arms 24 and 26 so as to fit into the slot 16 in the circuitboard 12 when the circuitboard is fully inserted into the

circuitboard receiving volume between the upper and lower pairs of arms as shown in FIGS. 3 and 4. The material from which the box-like body and all of the integral portions thereof is made is sufficiently flexible to permit the upper arms 28 and 30 to flex upwardly or outwardly away from the lower arms to permit insertion of the circuitboard in a resilient spring-like fashion as shown in FIG. 2.

**[0018]** In addition, the terminal 10 is provided with a first pair of tabs 36 which can be bent upwardly into gripping engagement with the stripped strands of a multi-wire conductor C as shown in each of FIGS. 1-4 to provide electrical continuity from the conductor C to the terminal 10. A second pair of tabs 38 can be folded onto one another to grip the insulated portion of the conductor C to maintain the mechanical engagement between the conductor C and the terminal 10.

**[0019]** As stated above, when the circuitboard 12 is inserted into the volume between the lower arms 24 and 26 and the upper arms 28 and 30, spring contact 40 is flexed downwardly toward the lower arms 24 and 26. As the circuitboard 12 reaches the detents 32 and 34, the upper arms 28 and 30 flex upwardly until they snap into the slot 16 to mechanically grip and engage the circuitboard and maintain substantially constant tension in the spring contact 40 regardless of the environment in which the combination shown in the figures is used. When the spring contact 40 is fully downwardly deflected as shown in FIG. 4, it is in full contact with the edge trace 20 to provide the desired electrical circuit. The circuitboard need not fit all the way into the volume so as to engage surfaces 41 as shown in FIG. 4; however, this is the preferred mechanical arrangement for purposes of maintaining stability of the combination.

**[0020]** The terminal 10 is preferably made of a stampable metal such as tin-plated brass or copper alloy. The various components of the finished terminal 10 are indicated in FIG. 5 when the terminal stamping is in the unfolded condition, the fold lines being represented by dashed lines in the drawing. A central lower aperture 46 is provided as shown along with a locking tab 42 and slot 44 to hold the terminal in the box-like folded condition after it is fully formed. The specific shape shown in FIG. 5 is for illustration purposes only as many variations and configurations are possible while still achieving the objectives and advantages of the device illustrated and

described above. The spring forces in a practical embodiment will be anywhere between approximately five to twelve Newtons, again by way of example. The circuitboard is typically a composite or laminated printed circuitboard with traces on one side only but may have traces on both sides in a particular embodiment.

**[0021]** While the invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not to be limited to the disclosed embodiments but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims, which scope is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures as is permitted under the law.